ALGEBRA.

121. Proposed by ELMER SCHUYLER, B. Sc., Professor of German and Mathematics, Boys' High School, Reading, Pa.

Solve $(x^5+y^5+z^5)^3+(x+y)^2=31$,
$(x^5+y^5+z^5)^3+(x+y+z)^3=729$,
$(x+y)^2+(x+y+z)^3=31$.

122. Proposed by JOSIAH H. DRUMMOND, LL. D., Portland, Me.

A man buys a five per cent. ten-year bond at such a price as enables him to spend annually three per cent. upon his investment and by continually investing the residue of the annual interest and its increase annually at four per cent., at the end of term upon payment of his bond has his original investment. What price per $100 does he pay for the bond?

*** Solutions of these problems should be sent to J. M. Colaw not later than Nov. 10.

GEOMETRY.

148. Proposed by DR. E. D. ROE, JR., Associate Professor of Mathematics in Syracuse University, Syracuse, N. Y.

The condition that two triangles, abc, xyz, are similar is

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ x & y & z \end{vmatrix} = 0,$$

and the condition that the triangle abc is equilateral is

$$\begin{vmatrix} a & b & 1 \\ b & c & 1 \\ c & a & 1 \end{vmatrix} = 0.$$

(Used in solving 130.)

149. Proposed by B. F. FINKEL, A. M., M. Sc., Professor of Mathematics and Physics, Drury College, Springfield, Mo.

Given a conic and two circumscribing triangles of the conic; prove that the six vertices of the triangles are con-conic.

150. Proposed by WILLIAM HOOVER, A. M., Ph. D., Professor of Mathematics and Astronomy, Ohio University, Athens, O.

Find the equation to a sphere cutting orthogonally four given spheres.

*** Solutions of these problems should be sent to B. F. Finkel not later than Nov. 10.

CALCULUS.

112. Proposed by J. SCHEFFER, A. M., Hagerstown, Md.

A sphere of radius r is pierced by a cylinder radius $\frac{1}{2}r$ so that the cylinder just grazes the center of the sphere. Find volume removed; the lateral surface and the spherical surface removed.

113. Proposed by JOHN M. COLAW, A. M., Monterey, Va.

At what rate per unit of time are the roots of the equation $(x+px+q=0)$ changing, if $p=mq$ and q varies uniformly at the rate of 1/12 per unit of time, when $p=12$ and m remains constant?

*** Solutions of these problems should be sent to J. M. Colaw not later than Nov. 10.